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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER

COLEMAN, WILLIAM D

ART UNIT	PAPER NUMBER
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2823

DATE MAILED: 02/21/2002

Please find below and or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/736,043

Applicant(s)

KUO, YUE

Examiner

W. David Coleman

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on 12 December 2000.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☐ Claim(s) 1-30 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☐ Claim(s) 1-30 is/are rejected.
- 7) ☐ Claim(s) 14 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on 12 December 2000 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s) _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other _____

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless --

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States

2. Claims 1, 2, 3, 4, 7, 8, 9, 10, 11 and 18 are rejected under 35 U.S.C. 102(b) as being anticipated by Gardner et al., U.S. Patent 5,350,484.

3. Pertaining to claims 1, 11 and 18, Gardner discloses a semiconductor process as claimed. See **FIGS. 2A-2C**, where Gardner teaches a method for forming a conductive pattern for a semiconductor device comprising:

patterning a mask layer **4** outwardly from a conductive layer **3** of the semiconductor device, the patterning defining portions **6** of the conductive layer **3** where vias through the conductive layer **3** are desired;

exposing the semiconductor device to a plasma **10**, the plasma converting the unmasked portions of the conductive layer **3** into a compound **8**; and

exposing the semiconductor device to a treatment process, the treatment process selectively removing the compound (column 8, lines 22-27).

4. Pertaining to claims 2 and 28, Gardner teaches wherein the conductive layer **3** comprises a copper material (column 6, lines 55-56).

Pertaining to claim 3, Gardner teaches removing the mask layer **4** from the semiconductor device

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5. Pertaining to claims 4 and 20, Gardner teaches removing the mask layer **4** after removing the compound **8**
6. Pertaining to claims 7 and 15, Gardner teaches providing a barrier layer **2** between the conductive material **3** and the substrate (not numbered).
7. Pertaining to claims 8 and 14, Gardner teaches wherein the conductive material **3** comprises a copper material, and wherein exposing the semiconductor device to a plasma **10** comprises exposing the semiconductor device to a chlorine-containing gas (column 7, line 26).
8. Pertaining to claims 9, 23, 24, 25, 26, 29 and 30, Gardner teaches wherein the compound comprise a copper chloride material **8**, and wherein exposing the semiconductor device to a treatment process comprises exposing the semiconductor device to a hydrogen chloride solution to remove the copper chloride material (See table III).
9. Pertaining to claims 10, 17 and 19, Gardner teaches wherein the mask layer comprises a photoresist material **5**.
10. Pertaining to claim 13, Gardner teaches wherein forming a conductive layer **3** comprises forming a copper layer outwardly from the substrate.
11. Pertaining to claims 16, 22 and 27, Gardner teaches wherein exposing the electronic device to a plasma comprises controlling the exposure of the electronic device to the plasma **10** to form a substantially perpendicular interface between the masked conductive material **3** and the compound **8**.

Claim Rejections - 35 USC § 103

12. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

13. Claims 5, 12 and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gardner et al., U.S. Patent 5,350,484 as applied to claims 1-4, 7-11, 13-20 and 22-30 above.

14. Gardner teaches a semiconductor process substantially as claimed, however, Gardner fails to teach the selection of removing the masking layers before removing the compound. Applicant is reminded that selection of any order of performing process steps is prima facie obvious in the absence of new or unexpected results. In re Burhans, 154 F.2d 690, 69 USPQ 330 (CCPA 1946). However, in the absence of new or unexpected results, the mere reversal of the order of performing process steps has been held to be prima facie obvious. In re Burhans, 154 F.2d 690, 69 USPQ 330 (CCPA 1946).

15. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Gardner et al., U.S. Patent 5,350,484 as applied to claims 1-4, 7-11, 13-20 and 22-30 above, and further in view of Ye et al., U.S. Patent 6,010,603.

16. Gardner discloses a semiconductor process substantially as claimed as discussed above. However, Gardner fails to teach wherein exposing the semiconductor device to a treatment process comprising: exposing the semiconductor device to a substantially inert atmosphere; and heating the semiconductor device to between 300 and 800 degrees Celsius to remove the compound. Ye teaches exposing the semiconductor device to a substantially inert atmosphere and heating the semiconductor device within the range as claimed to remove the compound. See column 13, lines 50-60, where Ye teaches the gas feed rates to the etch chamber were 140 sccm of argon, 15 sccm of chlorine, and 5 sccm of N₂. The preferred substrate temperature is

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preferably less than about 350⁰ C. In view of Ye, it would have been obvious to one of ordinary skill in the art to incorporate the compound removal process of Ye into the Gardner semiconductor process because it helps volatilize some species such as CuCl_x, enabling these species to leave the film surface (column 13, lines 60-62).

Specification

17. Claim 14 is objected to because of the following informalities: the term "exposing the electronic device to a plasma appears twice in the same sentence. Appropriate correction is required.

Conclusion

18. Any inquiry concerning this communication or earlier communications from the examiner should be directed to W. David Coleman whose telephone number is 703-305-0004. The examiner can normally be reached on 9:00 AM-5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael M. Fahmy can be reached on 703-308-4918. The fax phone numbers for the organization where this application or proceeding is assigned are 703-308-7722 for regular communications and 703-308-7721 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

W. David Coleman
Examiner
Art Unit 2823

WDC
February 16, 2002

